

# Advanced Particle-in-Cell (PIC) Tools for Simulation of Electrodynamic Tether Plasma Interactions, Phase I

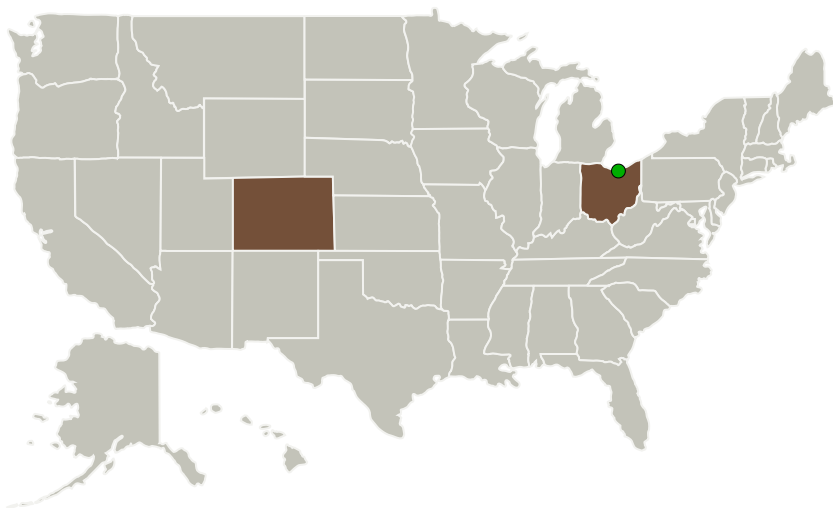
Completed Technology Project (2011 - 2012)



## Project Introduction

Electrodynamic tethers are optimally suited for use in Low-Earth-Orbit (LEO) to generate thrust or drag maneuver satellites. LEO region is polluted with space debris from the left over of rockets and abandoned satellites. It becomes important to clean them, i.e., de-orbit and ED tethers are promising for such applications. ED tethers are operating without propellants, so less polluting in our space and also cost-efficient. Tether powered satellites can operate in dual mode (thrust or power generation). Advanced PIC tools can perform self-consistent 2-D and 3-D tether simulations to study the plasma interactions and will improve the understanding of the self-induced magnetic field effects on the current collection ability of these ED tethers. These tools once validated using tether ribbon tape experiments can help NASA researchers to analyze various tether geometries in efforts to optimize tether design for space missions on a wide range of operating conditions.

## Primary U.S. Work Locations and Key Partners



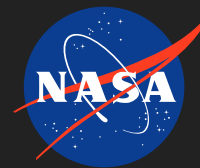
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## Table of Contents

Project Introduction	1
Primary U.S. Work Locations and Key Partners	1
Project Transitions	2
Organizational Responsibility	2
Project Management	2
Technology Maturity (TRL)	2
Technology Areas	3
Target Destinations	3

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Organizations Performing Work	Role	Type	Location
Tech-X Corporation	Lead Organization	Industry	Boulder, Colorado
Colorado State University-Fort Collins	Supporting Organization	Academia	Fort Collins, Colorado
● Glenn Research Center(GRC)	Supporting Organization	NASA Center	Cleveland, Ohio

## Primary U.S. Work Locations

Colorado	Ohio
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## Project Transitions

**February 2011:** Project Start**February 2012:** Closed out

## Closeout Documentation:

- Final Summary Chart(<https://techport.nasa.gov/file/137969>)

## Organizational Responsibility

**Responsible Mission Directorate:**

Space Technology Mission Directorate (STMD)

**Lead Organization:**

Tech-X Corporation

**Responsible Program:**

Small Business Innovation Research/Small Business Tech Transfer

## Project Management

**Program Director:**

Jason L Kessler

**Program Manager:**

Carlos Torrez

**Principal Investigator:**

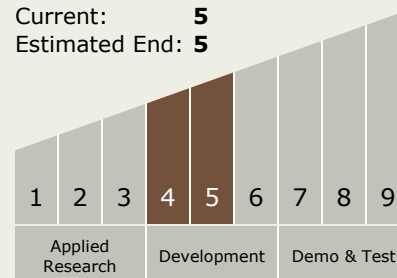
Sudhakar Mahalingam

## Technology Maturity (TRL)

Start: 4

Current: 5

Estimated End: 5



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## Technology Areas

### Primary:

- TX01 Propulsion Systems
  - └ TX01.4 Advanced Propulsion
    - └ TX01.4.2 Electromagnetic Tethers

## Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System